AbstractID: 14009 Title: Evaluation of effective dose in region-of-interest neuroimaging

Purpose: Small field-of-view (FOV) region-of-interest (ROI) imaging has been used for integral dose reduction and to improve image quality by reducing scatter and providing increased resolution. We quantify the reduction of effective dose (ED) realized when using ROI techniques in neuroimaging. **Method and Materials:** We have developed a high-resolution microangiographic fluoroscopic (MAF) detector to provide improved visualization of fine detail in the treatment volume during neurointerventional procedures and in ROI cone-beam CT. Using PCXMC (STUK, Helsinki, Finland), the ED was calculated for the 3.6x3.6-cm FOV of the MAF, for the 20x20-cm FOV of the Varian PaxScan 2020 FPD and for a 3.6x20-cm FOV as used in dual detector ROI CBCT. Calculations were made for 210 degrees of RAO/LAO projections centered on the circle of Willis for spectra using the 3 beam filters available on the Toshiba Infinix C-Arm fluoroscopic system. ED values were determined as a function of kVp for an air kerma at the detector for 1 microGray, where the entrance skin exposure was determined using SP78 software and the attenuation of the AAPM Report 31 head phantom. Values for individual projections and summed values for CBCT scans were determined. **Results**: Effective dose per detector exposure decreases with increasing kVp for all three filters and for all FOV's. Compared to the FPD, use of the MAF detector allows a reduction of ED by a factor ranging between 50 to 70 over the range of beam filters and kVp's used. **Conclusions:** Substantial reduction in effective dose per detector exposure is realized using ROI techniques in neuroimaging. This reduction would allow the dose in the ROI to be increased over an order of magnitude to provide increased contrast resolution without increasing the stochastic risk to the patient compared to full-FOV imaging.

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